STATUS OF MINERAL RESOURCE INFORMATION FOR THE FORT MOJAVE INDIAN RESERVATION, ARIZONA, CALIFORNIA, AND NEVADA

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Administrative Report BIA-78
1981

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SUMMARY AND CONCLUSIONS

The Fort Mojave Indian Reservation[1] mineral potential is low. There are no known metallic mineral deposits within the reservation and very little production has been recorded nearby.

Alluvial material covering most of the area makes evaluation or prediction of subsurface mineral potential extremely difficult (Campbell, 1964). No extensions of the Ibex mining district to the west appear on the surface within the boundary; however, deeply buried ore deposits may occur.

The Eldorado mining district, 20 miles north, produced several million dollars in gold (Vanderburg, 1936). The district appears to be a possible source for placer gold deposits occurring along the Colorado River. Previous dredging attempts near Eldorado Canyon have failed because of an inability to recover fine gold.

Potential for secondary uranium deposition exists within the reservation as indicated by Department of Energy studies of the surrounding area (Otton, personal commun., 1980). Tertiary sediments appear to be the most likely hosts for minerals and, in places not subject to migrating acidic ground water, major economic deposits could exist.

By far the most common material in the area is alluvial fill, which at present has no economic value. Gravel deposits on the extreme east and west sides of the reservation may be economic for use as aggregate or decoration. There appear to be no other potentially economic minerals.

Future field investigations should include stream bed sampling for placer gold potential, and well and spring water sampling for indications of uranium or other metallic minerals.

[1]The Fort Mojave Indian tribe has officially adopted the spelling "Mojave" (Kunkel, 1970). The spelling on the figures corresponds to that on other published maps.

INTRODUCTION

This report was prepared for the Bureau of Indian Affairs (BIA) by the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey (USGS). Its purpose is to compile and summarize available information on the geology, minerals, energy resources, and economic development potentials of certain Indian lands.

Information is from published and unpublished materials as well as from personal communications. No field work was done. Samuel McNary, Geologist, U.S. Bureau of Mines, Spokane, Washington, was a valuable help in suggesting sources of information. His help is greatly appreciated.

Geography

The Fort Mojave Indian Reservation includes a total of 32,679.65 acres along the Arizona, California and Nevada borders (Figure 1). According to a 1978 annual report on Indian lands, the reservation comprises 5,997.05 acres in California, 22,820.45 acres in Arizona, and 3,862.15 acres in Nevada. Tribal headquarters is in Needles, California, one mile west of the 24-mile-long (north-south) by 7-mile-wide reservation. There are 650

Mojave Indian tribal members, 383 of whom live on or near the reservation.

In 1978 there were nine commercial and agricultural enterprises in operation on the reservation. Three to six more were planned by 1980 (BIA, 1978). There are no mineral industries on the reservation (Norvin McCord, personal comm., 1980).

Needles, California, population 5,000, is the largest adjacent city and a center for rail, truck, and airline travel (U.S. Dept. of Commerce, 1974). Interstate highway 95 runs through Needles and along the southwestern boundary of the reservation. Reservation access is by secondary paved highways and several gravel roads.

Summers tend to be very hot and dry with temperatures reaching 125º F. Average annual precipitation of 8.6 inches occurs mainly during the fall and winter months (National Oceanic and Atmospheric Administration, 1978). The Colorado River bisects the area, flowing north to south within 6 miles of all parts of the reservation. No water shortage is indicated. The Colorado is the only local major stream, and its valley is filled with river transported alluvium. Numerous domestic and irrigation wells can be found throughout the area.

Map Coverage

Topographic maps of the reservation may be ordered from the Branch of Distribution, U.S. Geological Survey, Denver Federal Center, Denver, Colorado 80225 (Figure 2).

Small scale geologic map coverage is available on a 1:1,000,000 map of Nevada (Stewart, and Carlson, 1977), and the Needles 1:250,000 map of a portion of California, distributed by California Division of Mines and Geology . A large scale (1:24,000) series is available f rom Southern Pacific Railroad Co., Southern Pacific Building, One Market Plaza, San Francisco, California 94105.

Physiography

The reservation is in the Mojave Valley bounded by the Black Mountains, 12 miles east, and the Dead Mountains, 6 miles west. Quaternary alluvium is predominant with minor paleo-lake sediments and older terraced gravels along the edges of the area.

Altitudes range from 460 feet where the river crosses the southern reservation boundary to 790 feet at the westernmost point of the boundary (Figure 3). Drainage patterns on the flood plain include many swamps, sloughs, and small lakes which are included in the Lake Havasu National Wildlife Refuge. The refuge extends approximately 7 miles into the south end of the reservation.

Previous Work

The geology of parts of the Mojave Indian Reservation has been studied in connection with hydrologic studies of the Colorado River. Metzger and Loeltz (1973) studied the Colorado River alluvial deposits on the Fort Mojave Indian Reservation. Test well and soil data in the area were published by Kunkel (1969). No detailed geologic study of the entire reservation has yet been done.

GEOLOGIC SETTING

The Fort Mojave Indian Reservation is located on part of the floodplain of the Colorado River in an area of undifferentiated alluvial sediments and sedimentary rocks of Quaternary age that include floodplain deposits and fanglomeratic deposits derived from the surrounding mountains (Figure 4). No structure has been observed in the rocks and sediments.

Stratigraphy

The Fort Mojave Indian Reservation lies wholly within the Mojave Valley and is underlain entirely by older and younger Quaternary alluvium with the exception of one small outcrop of the Bouse Formation (Metzger and Loeltz, 1973) near the California-Nevada border (Figure 4). The Bouse Formation is Tertiary in age and composed of silt, sand, clay, and tufa. The outcrop pattern of Bouse Formation indicates that it is probably overlain by both the Older and Younger alluvium (Metzger and Loeltz, 1973). This sequence, in turn, probably overlies the older sedimentary, plutonic, volcanic, and metamorphic units that are exposed in the surrounding mountains.

Economic Geology

There are no known metallic mineral deposits in the Fort Mojave Indian Reservation in the immediate surrounding area. Manganese, copper, silver, and gold occur in the Dead Mountains and Sacramento Mountains to the east, and the Chemehuevi Mountains to the south. However, these are mainly small occurrences and the probability is small that any of these extend into the reservation area. Sand, gravel, and clay are all potential resources of the reservation, but necessitate favorable economics in order to be exploited.

MINERAL RESOURCE POTENTIAL

Deposits of alluvial gravel, the only mineral commodity reported to be produced from the reservation, have been mined at several sites for highway and road fill (Figure 5). These deposits are found along all streams and have shown no metallic minerals. The Colorado River flood plain makes up the major portion of reservation land. Nearby highlands north and west of the reservation had gold, silver, copper, lead, and manganese production from several small properties in the early 1900's. Ore grade material seems to have been found, the high grade material mined out, and the properties subsequently abandoned. These mines appear to be associated with northwest-trending quartz veins in a gneissic granite complex.

Placer gold potential in the reservation is indicated by lode deposits to the north on the Colorado River. These deposits show large gold production in the past and are a possible source for the Marble Heart Placer location near Needles. Other deposits may exist between these two occurrences and possibly on the reservation.

The entire subsurface of the reservation appears to be saturated with water which is recharged by rainfall and infiltration from the Colorado River and minor washes in the lowland hills.

Eldorado Mining District

History and Production

The Eldorado district is in the Opal Mountains of southern Clark County, Nevada, 20 miles north of the reservation. Since 1857, it has yielded lode gold and silver worth several million dollars and Colorado River placer gold worth several thousand dollars (Vanderberg, 1936).

In 1909 two large suction dredges were operated on the Colorado River. Results were discouraging and work was discontinued. In 1934, 125 ounces of gold were recovered by small operations. The fine particle size of the gold and its association with a high concentration of black sands made it uneconomic for large scale dredging in 1936.

Today's high gold prices and improved dredge and separation technologies may make it economic to mine certain Colorado River bars.

Ibex Mining District

History and Production

Five miles southwest of the reservation is a cluster of small gold, silver, copper, lead, and manganese mines and prospects. Production records indicate that only 100 tons total material were shipped in the early 1900's (USBM, 1980). Assays averaged .17 oz gold per ton, 16 oz silver per ton, 44 lbs copper per ton, and 21.5 lbs lead per ton. These small past producers are in the Sacramento Mountains in a granite-granodiorite to diorite gneiss complex which appears to underlie some local volcanics and alluvial material near the reservation (Bonham and Tischler, 1960). Deep lateral extensions of this complex might exist within the reservation; however, the thickness of alluvial material would make exploration difficult.

All mines near the reservation are described in Table 1.

ENERGY RESOURCES

Uranium

Granitic mountain ranges surrounding the reservation may possibly be good sources for secondary uranium deposition. The adjacent lowlands have indicated potential deposits (Otton, personal comm., 1980). Host rocks appear to be the Gene Canyon and Copper Basin Formations with uranium being tied up with included organic materials or in silicified zones.

The high saturation of the alluvial material on the reservation indicates an oxidizing environment which would probably allow the uranium ion to be mobilized and flushed downstream. Under these conditions, it is unlikely that any shallow economic deposits exist on the reservation. However, deeply buried deposits in Tertiary sediments not subject to the migration of oxidizing ground water might be located on the reservation.

Geothermal

The only indication of nearby geothermal potential is a 500-foot deep well in the NW¼ sec. 24, T. 32 S., R. 65 E. Well water has a temperature of 81º F and is 7 miles north of the reservation.

Within the reservation the only possibility of a geothermal resource would seem to be at great depths.

Solar Energy

Solar energy is being investigated on the reservation; it should be a major future means of heating water and homes. The area is ideally suited for this type of heating because of the high percentage of cloudless days and the directness of the sun in winter months.

RECOMMENDATIONS FOR FURTHER WORK

The reservation appears to have some potential for placer gold deposits along the Colorado River. Deeply buried uranium deposits are not expected, but may be present.

Specific recommendations regarding a possible field study are as follows:

1. Stream sediment geochemical sampling, including panned concentrates, of the Colorado River bars, especially in the northern part of the reservation.

2. Geochemical water well and spring sampling for uranium and various other metallic minerals.

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Table 1.--Description of mines, prospects, and gravel pits in the vicinity of the Fort Mojave Indian Reservation, Arizona, California and Nevada

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[Numbers correlate with locations on figure 5]

No.	Name	Location	Commodity	Description
1	Cumberland Group	Sec. 28, 29, T. 32 S., R. 66 E., M.D.B.M.	Gold, silver vanadium, molybdenum, zinc, and lead	Developed by a number of shallow cuts, pits, two adits and a 156-ft shaft. Ore deposits occur in granodiorite veins striking to the northeast and dipping to the northwest (Vanderburg, 1936).
2	Rio Lomes No. 3	E1/2, Sec. 11, T.19 N., R. 22 W., G & S.R.B.M.	Sand and gravel	Production unknown (USBM, 1980)
3	Black Mountain (Gallagher)	Sec. 17, 20, T. 10 N., R. 22 E., S.B.B.M.	Manganese	Northwest of Needles in the Dead Mountains. Small scattered lenses of psilomelane and calcite in granodiorite gneiss. A few hundred pounds produced since 1918 (Jenkins, 1953).
4	Black Mountain Claims	Sec. 26, T. 10 N. R. 21 E., S.B.B.M.	Copper	Northwest of Needles on south end of Dead Mountains. Large group of claims; appears to be inactive (Jenkins, 1953).
5	Chouse	Sec. 19, T. 9 N., R. 22 E., S.B.B.M.	Gold and silver	No known production (Jenkins, 1948)
6	Bruce	Sec. 19, T. 9 N., R. 22 E., S.B.B.M.	Copper	No known production (Jenkins, 1948)
7	Vaughn and Benedict	Sec. 29, T. 9 N., R. 22 E., S.B.B.M.	Gold and silver	No known production (Jenkins, 1948)
8	Stemwinder	Sec. 29, T. 9 N., R. 22 E., S.B.B.M. (approximate)	Lead, silver, and gold	Approximately 80 tons produced from 1911 to 1917. High silver values with minor gold, copper, and lead (USBM).

Continued

Table 1.--Description of mines, prospects, and gravel pits in the vicinity of the Fort Mojave Indian Reservation, Arizona, California and Nevada (Continued).

[Numbers correlate with locations on figure 5]

No.	Name	Location	Commodity	Description
9	Marble Heart Consolidated Placer	Sec. 29, T. 9 N., R. 22 E., S.B.B.M.	Gold	No known production (Jenkins, 1953).
10	Josie K. (Juleff, Red Cross)	Sec. 30, T. 9 N., R. 22 E., S.B.B.M.	Copper and gold	Oxidized minerals in quartz vein at granite-rhyolite contact. Reported to assay $11 in gold and 14 percent copper in 1909. Shallow workings intermittent along the 4,000 ft strike of outcrop (Jenkins, 1953).
11	Brice	Sec. 29, T. 9 N., R. 22 E., S.B.B.M. (approximate)	Gold and silver	No known production (Jenkins, 1948).
12	Copper Gulch (Big Butte, Copper Butte)	Sec. 28, T. 9 N., R. 22 E., S.B.B.M.	Copper and gold	Mineralized quartz vein in granite. Strike northwest, dip vertical. Developed by two shafts, 125 ft and 600 ft deep and two adits. Ore reported to assay 3.5 to 8% copper and $6 to $11 per ton gold in 1940. One shipment said to be valued at $27 per ton gold (Jenkins, 1953).
13	Afton Canyon (Van Deventer, Cliffside Van Deventer)	N1/2 sec. 18, T. 8 N., R. 28 E., S.B.B.M.	Magnesite	Contact replacement of Archean lake sediments by basic igneous intrusive complex. One hundred thousand to two hundred thousand tons of 30 percent MgO content; silica and lime content high (Jenkins, 1953).
14	Lackey Concrete	Sec. 29, T. 8 N., R. 23 E., S.B.B.M.	Sand and gravel	Quantity of production unknown (USBM, 1980).

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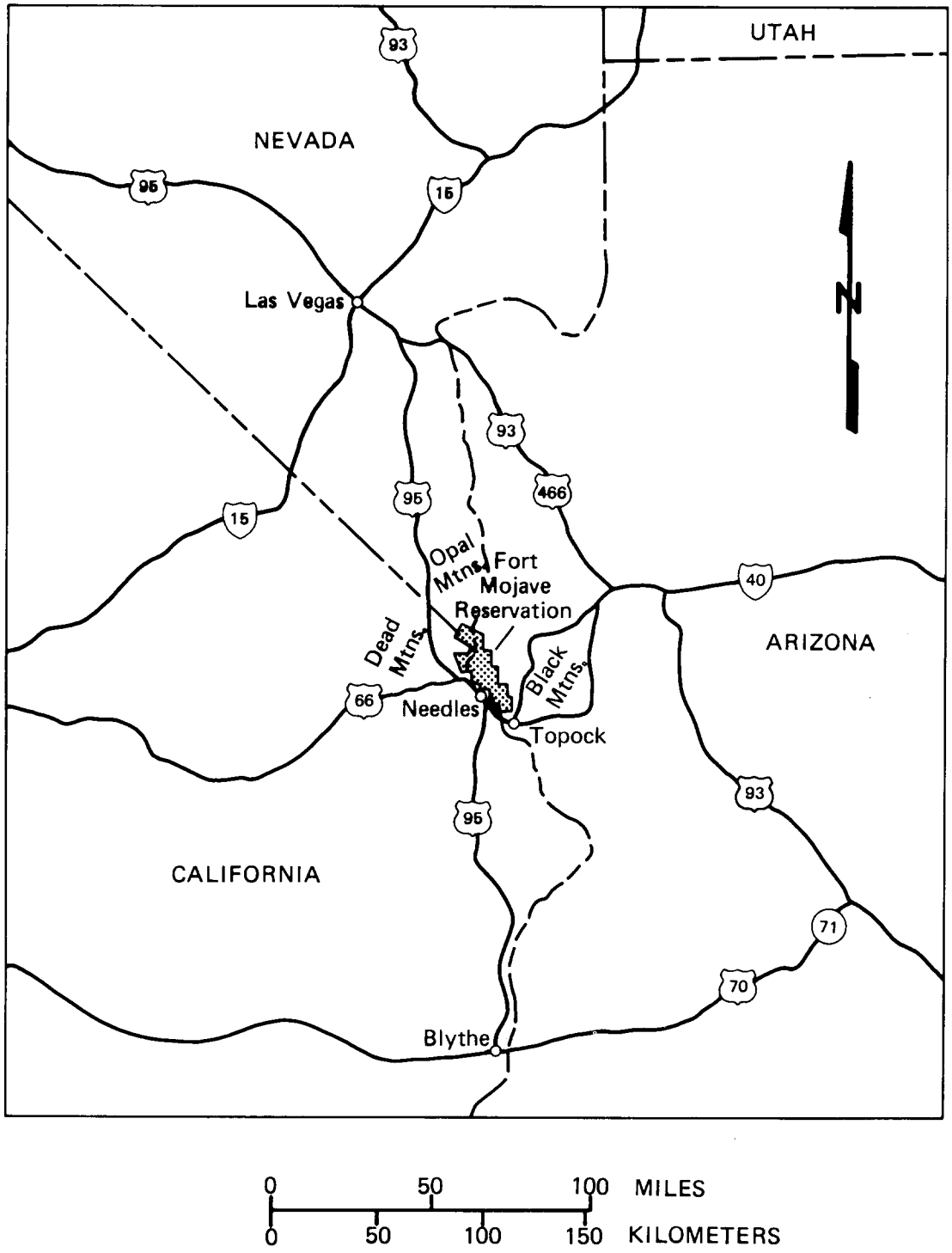

Figure 1. Location map for the Fort Mojave Indian Reservation, Arizona, California, and Nevada.

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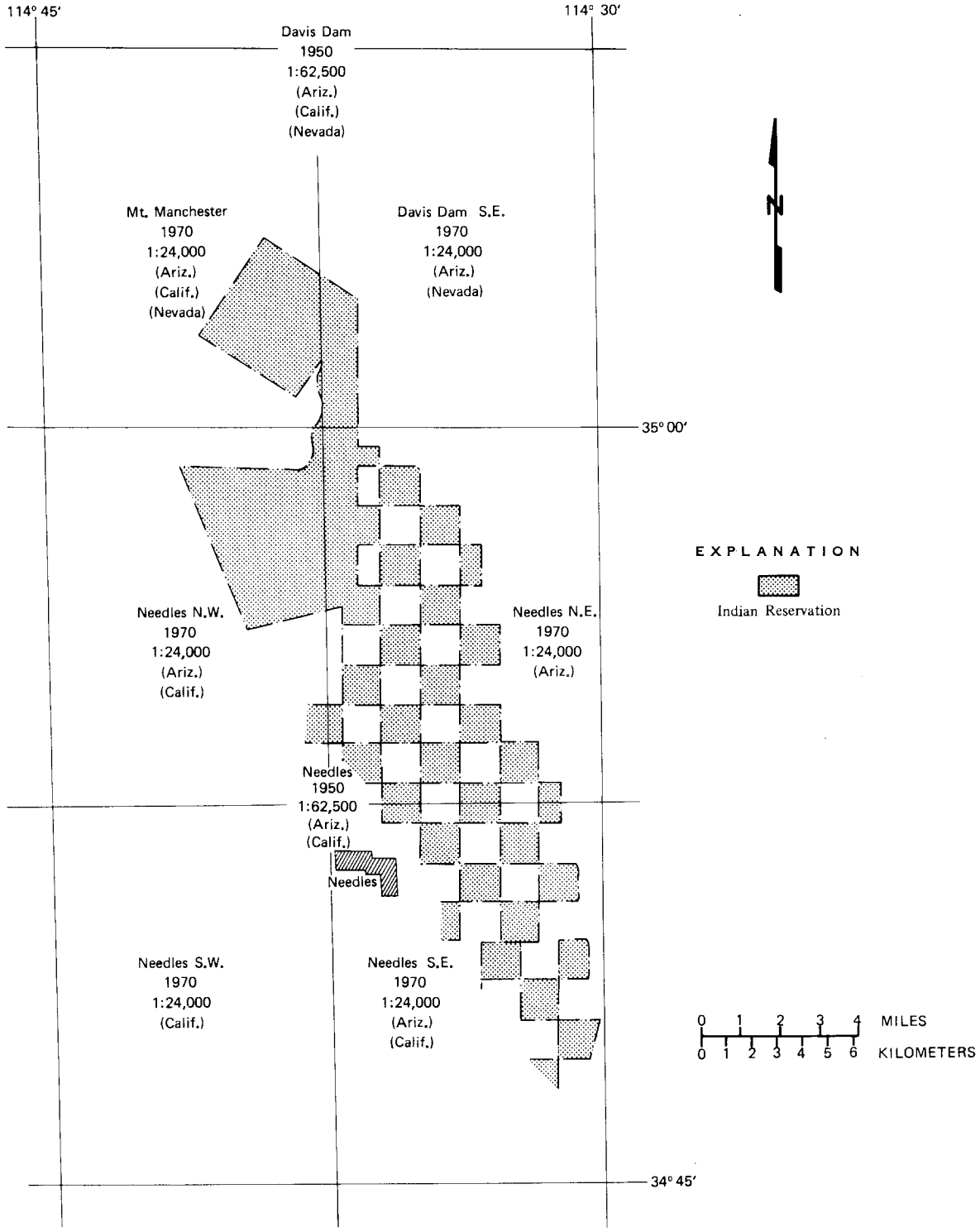

Figure 2. Index to topographic maps of the Fort Mojave Indian Reservation.

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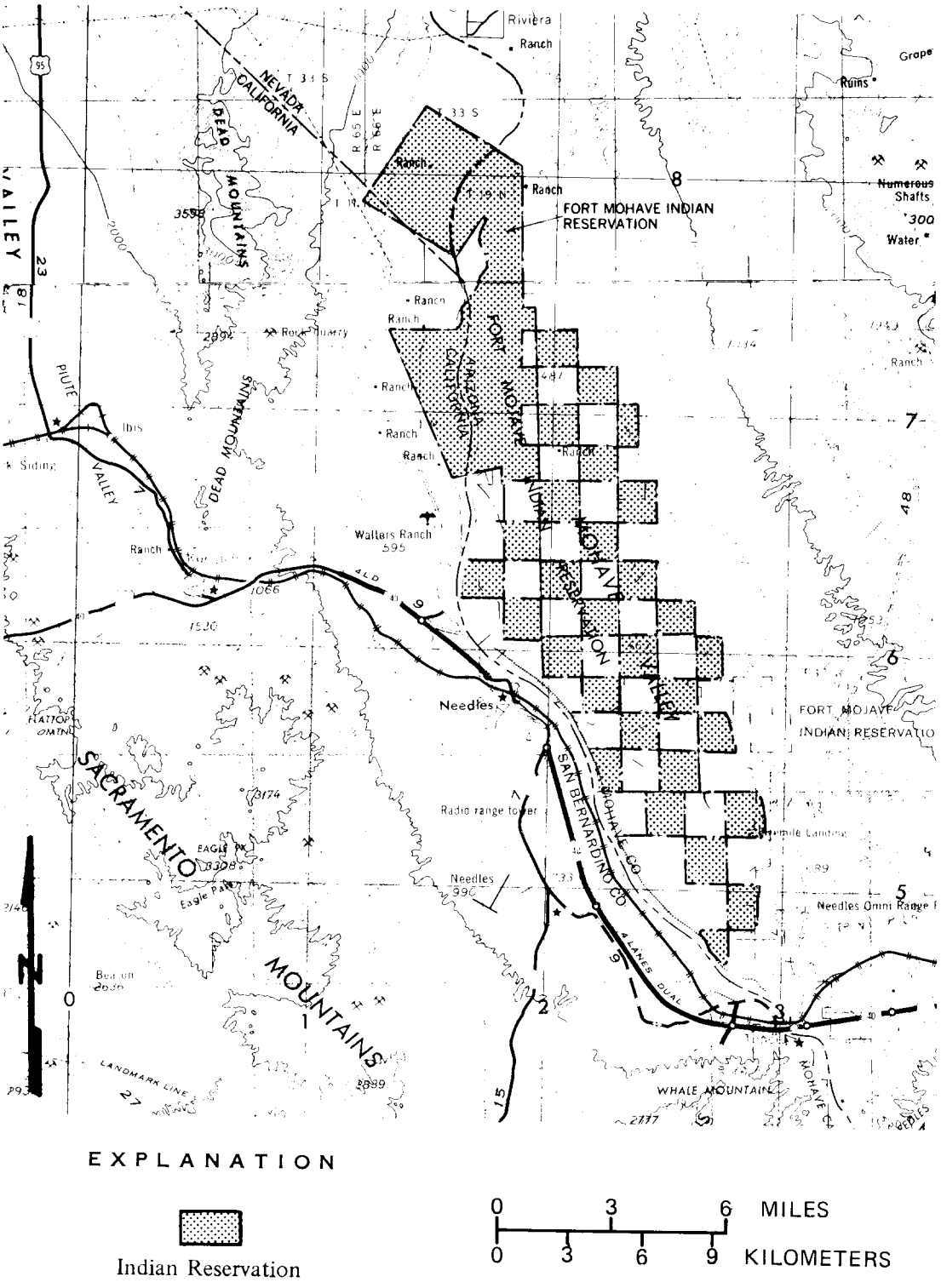

Figure 3. Topographic map of the Fort Mojave Indian Reservation and surrounding area.

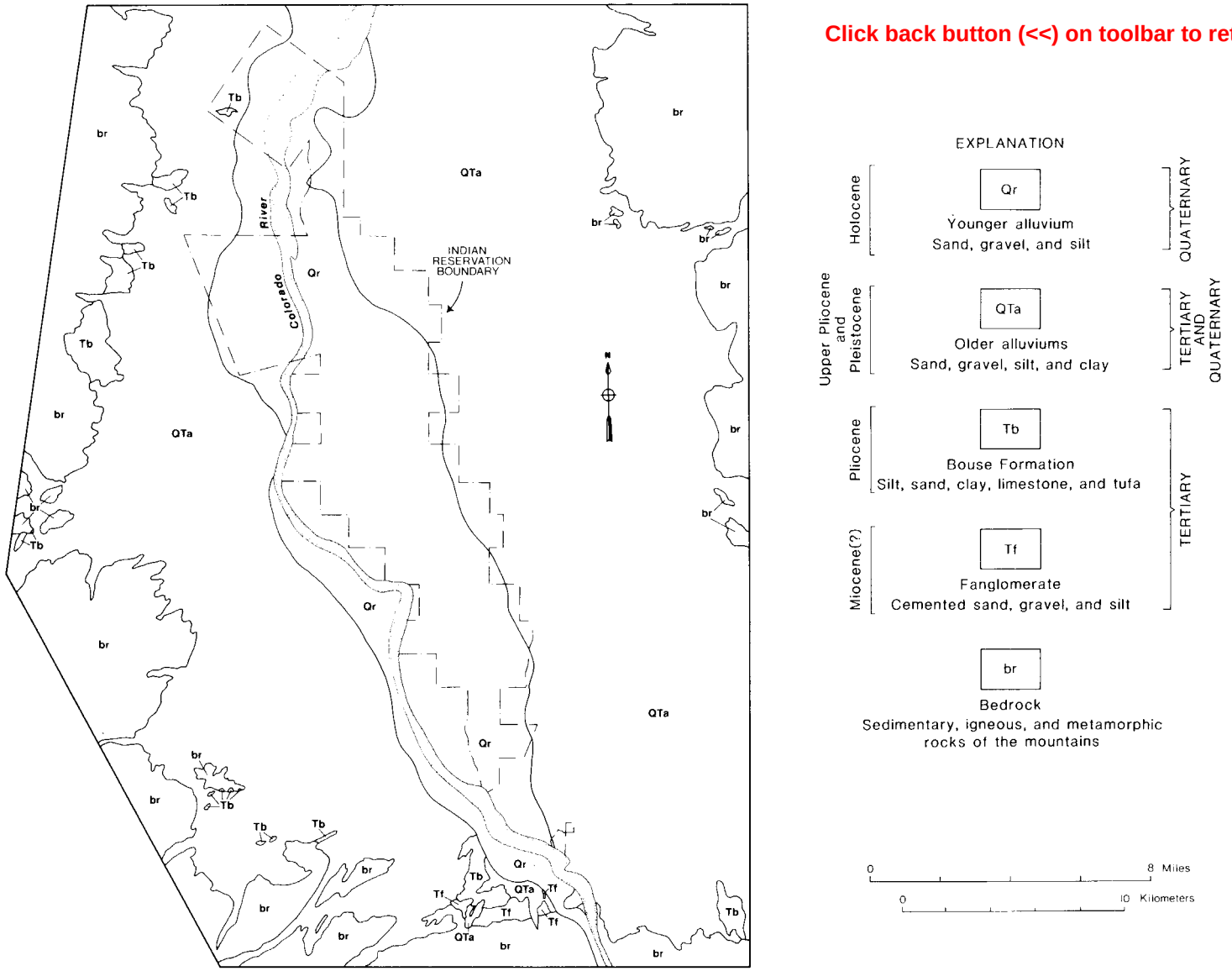

Figure 4. Generalized geologic map of the Fort Mojave Indian Reservation (modified from Metzger and Loeltz, 1973).

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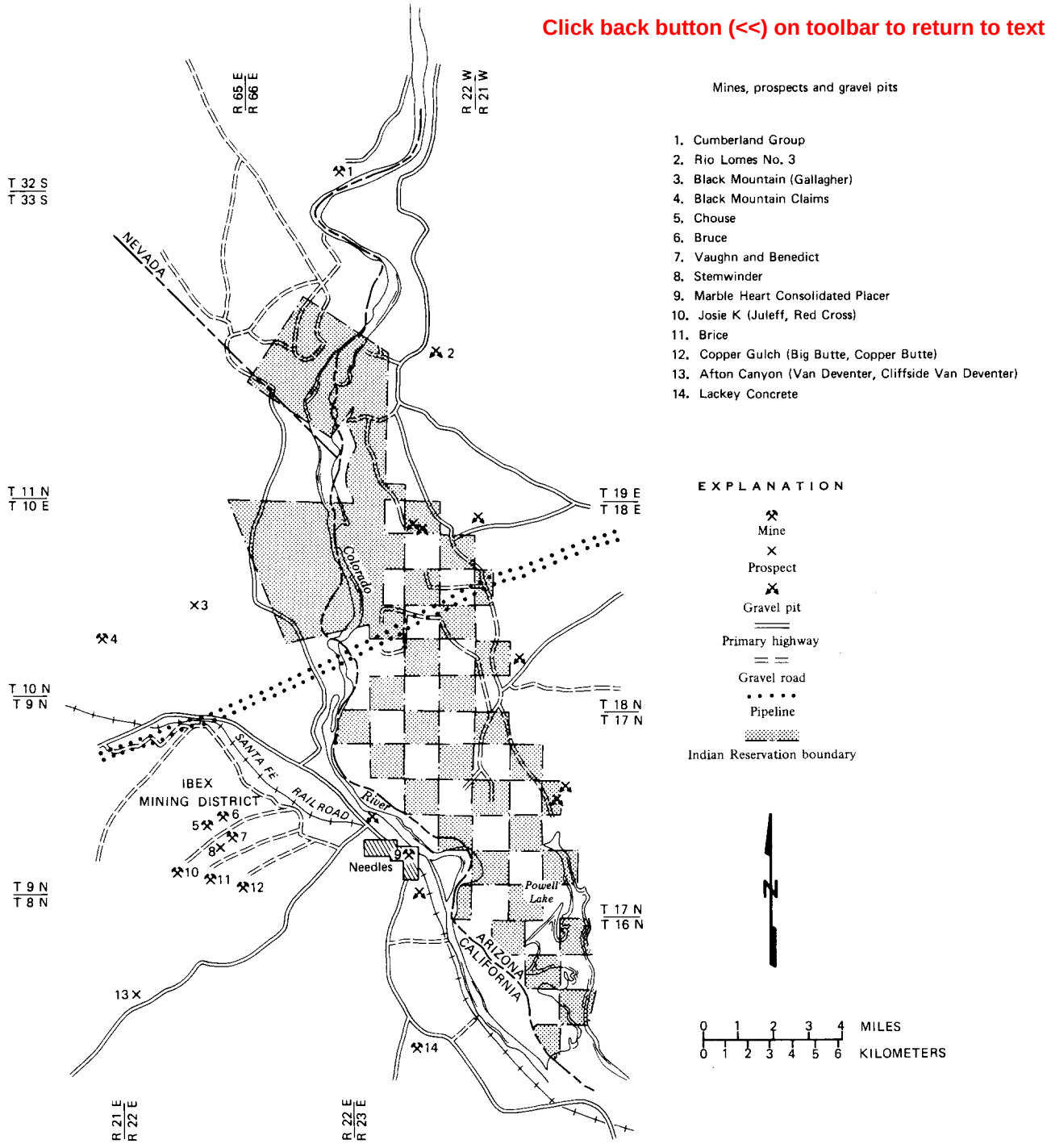

Figure 5. Mineral occurrences of the Fort Mojave Indian Reservation and surrounding area.